PROJECT INFORMATION
Hemlock Wooly Adelgid Suppression Project

The USDA Forest Service is initiating an environmental analysis process for the proposed Hemlock Wooly Adelgid (HWA) Suppression Project pursuant to the National Environmental Policy Act (NEPA). The project area is located on the Hector Ranger District of the Finger Lakes National Forest (FLNF) in the Town of Lodi in Seneca County, and Hector in Schuyler County, New York (see attached maps.) HWA is a non-native insect that defoliates Eastern hemlock (*Tsuga canadensis*) trees and has an established and growing infestation on the FLNF. The proposed action is to expand HWA suppression efforts already in place on the FLNF with biological and chemical control methods.

BACKGROUND

Hemlock Wooly Adelgid (HWA) (*Adelges tsugae)* is an exotic pest native to Asia that defoliates Eastern and Carolina hemlocks. HWA infestations cause a decline in tree health that can lead to widespread mortality, which can have catastrophic implications to local ecosystems. The FLNF has unique hemlock habitat that is faced with an active HWA infestation similar to those faced by National Forests in the mid-Atlantic and southeastern states. Biological and chemical controls methods have gone through an environmental analysis and implementation for one parcel on the FLNF, Caywood Point, but the infestation has since spread throughout the FLNF and can be found on adjacent private land.

Hemlock Importance and Ecology

Eastern hemlock (*Tsuga canadansis*) is a slow growing and highly shade tolerant deciduous tree that is common in portions of the FLNF. Eastern hemlock may take 250 to 300 years to reach maturity with the potential to live for 800 years or more. Eastern hemlock ranges from the Canadian Maritimes west to Ontario and portions of Michigan south to Georgia and Alabama where it's range overlaps with Carolina hemlock (*Tsuga caroliniana*). (Silvics of NA). Hemlocks grow on over 19 million acres of forest in eastern North America and are considered the dominant species on 2.3 million acres, with HWA now extending across much of this range. This species is the most shade tolerant species in the Eastern United States, allowing for a deep canopy that is able to extend to the forest floor. Hemlocks are frequently found on the FLNF in ravines or gorges near running streams, but may also be found in upland locations mixed with northern hardwood species. These characteristics of hemlock create very unique ecological importance. (Ward et.al 2004)

Hemlock forests provide unique wildlife cover with utilization by more than 120 vertebrate species as well as 90 species of birds, some depending heavily on hemlock cover. Location of hemlocks along streamcourses as seen on the FLNF helps to maintain aquatic habitat health and diversity through regulation of streamflow and water temperature due to shading. In a study completed at the Delaware Water Gap National Recreation Area in 2002, streams that were predominantly shaded by hemlock were found to have higher amounts of macroinvetebrate diversity and higher brook trout populations than streams shaded only by hardwoods. Hemlock shaded streams were also found to have lower summer temperatures and were less likely to run dry. (Evans 2002) Hemlock mortality is also linked to soil nutrient losses and subsequent water quality issues (York 2000), an ongoing and serious problem in the Finger Lakes and greater Great Lakes Basin watersheds.

Hemlock forests such as those found on the FLNF are also a dominant component of regional outdoor recreation based tourism. The visual aesthetic created by hemlock ravines and forests is evident along numerous hiking trails on the FLNF, but also in nearby NY State Parks. These forests and ravines provide a glimpse of a climax forest similar to those found before European settlement. There are also over 200 cultivars of Eastern hemlock, making it a prized landscape tree species. A 2014 study conservatively estimated a loss of $24.6 million in property values due to hemlock mortality in the southern New England region alone. Data was unavailable to extrapolate further economic losses due to degraded recreational opportunities and overall hemlock mortality, however they are expected to be

substantial (Xiaoshu et. al 2014) Hemlock also has low to moderate commercial importance from a timber management aspect.

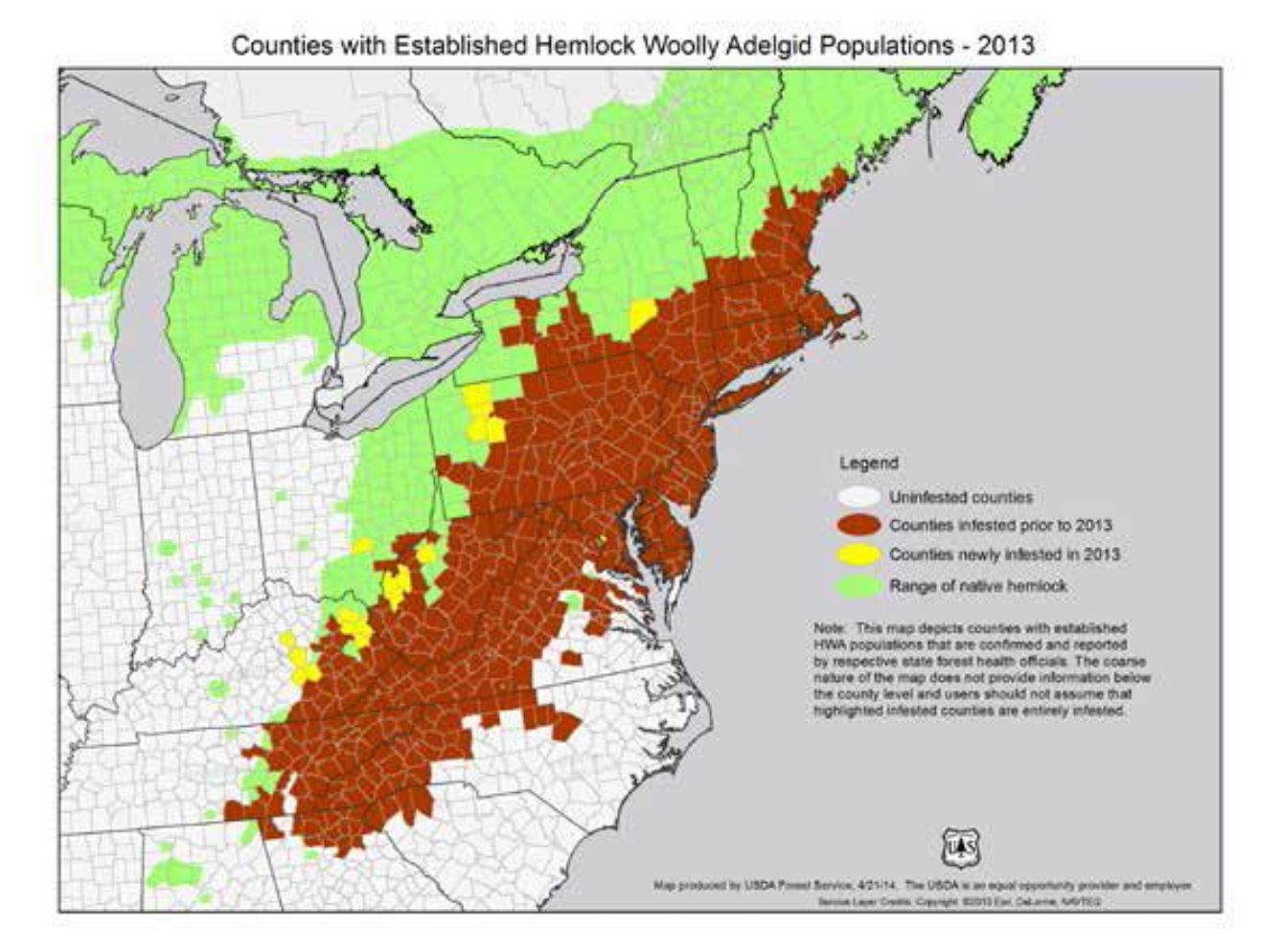

Figure 1 Range of Hemlock and HWA 2013

Hemlock Wooly Adelgid

Hemlock Wooly Adelgid (*Adelges tsugae* Annand) (HWA), is a member of the Adelgidae family of insects and is native to Asia. A distinct lineage of the insect is native to western North America, where it hosts on Western Hemlock (*Tsuga heterophylla*) and Mountain Hemlock (*Tsuga mertensiana*), however the genotype of HWA found in eastern North America can be traced to southern Japan. The first record of HWA in the eastern United States dates to 1951 in Richmond, Virgina, with the insect likely arriving some time prior to that on live plant material. (Havill, et. al. 2014)

HWA in eastern North America reproduces asexually, with two complete generations a year on hemlock. The adelgid itself is less than 1/16th of an inch, but it's presence is visible through the wool-like wax filament (ovisacs) it develops to protect itself and its eggs. These ovisacs may be readily observed on the underside of the outermost branches of hemlock trees, particularly from late fall to early summer(See Figure 2). Upon hatching, adelgid nymphs will feed on stored nutrients at the base of hemlock needles. Depletion of these nutrients cause decline in tree health leading to mortality within 4 to 10 years. Mortality may be observed sooner in the southern range of the infestation or where other stress factors such as drought, poor site quality, or other insect and disease act in concert. Dispersal of HWA may occur by wind, bird, other wildlife, or humans when contact is made with the sticky wool-like ovisacs (Pest Alert, 2005.)

As depicted in Figure 1 above, the current HWA infestation in eastern North America covers approximately half of the native range for Eastern and Carolina Hemlock. The infestation covers nearly all of the southern range of hemlock, with the infestation spreading more slowly to the north due to HWA survivability declining in colder climates. (Havill, et. al. 2014) Despite the HWA survival rates declining with cold weather, current infestations have the potential to persist and continue to spread for two reasons. Due to the HWA's asexual reproduction, only a single insect needs to survive a winter in order to reproduce. Secondly, research suggests cold hardiness is a trait that may be genetically passed on, leading to an infestation that may be increasingly hardy to cold temperatures. (Whitmore, 2014.) The winter of 2013/2014 was exceptionally cold in central New York, but infestations in the Finger Lakes region persisted.

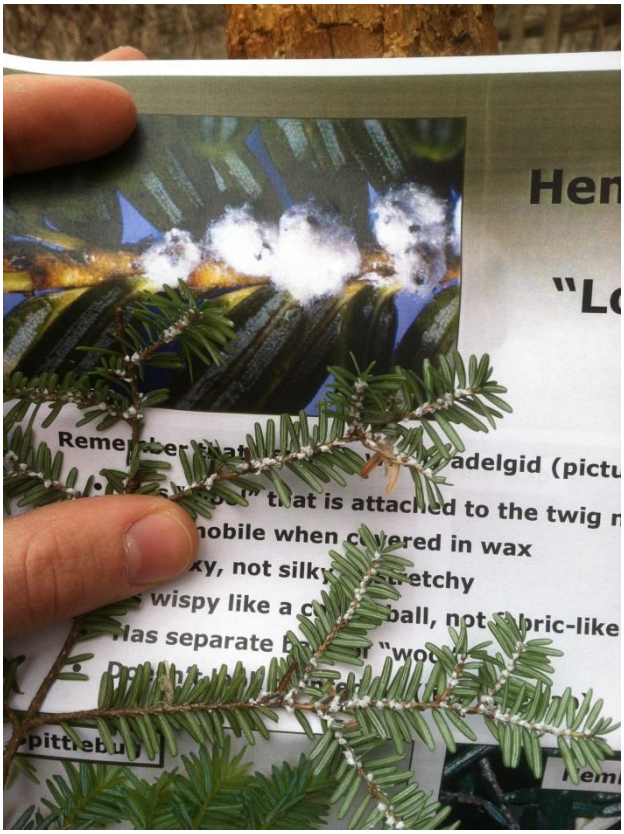

Figure 2 HWA infested branch on top of zoom photo

FLNF Infestation

HWA was discovered in New York State in 1985 spreading throughout Long Island and the lower Hudson Valley through the 1990's. Between 1998 and 2008 the spread continued north along the Hudson, with new populations showing up in the Finger Lakes region and Western NY. A very light HWA infestation was detected in 2008 on the FLNF on overstory and understory hemlocks at the northern drainage of Caywood Point during a survey conducted by officials from Cornell University, FLNF, and volunteer partners. Subsequent hemlock surveys of the FLNF the following spring conducted by Cornell and the Forest Health Protection (FHP) staff confirmed that the HWA infestation was limited to just a few trees at Caywood Point.

In the spring of 2009, Natural Resource specialists and scientists from the Green Mountain National Forest, the FLNF, University of Massachusetts, Cornell University, FHP, and New York Department of Environmental Conservation met to discuss HWA management options. The team opted for biological control utilizing the *Laricobius nigrinus* predator beetle as a method of control at Caywood Point. In

October of 2009, 300 *L. nigrinus* beetles were released with an established population confirmed from 2010 through 2014. Despite the establishment of L. nigrinus as a predator, the HWA population continued to grow with mortality confirmed in the spring and fall of 2012. An environmental analysis was completed in January of 2013 to utilize chemical control methods on approximately 300 trees at Caywood Point to prevent imminent widespread hemlock mortality (Caywood HWA DM, 2013.) Control work was implemented in the summer of 2014 via contract application of imidicloprid and dinotefuran.

Figure 3Hemlock with chem control

Figure 4Hemlock with no control

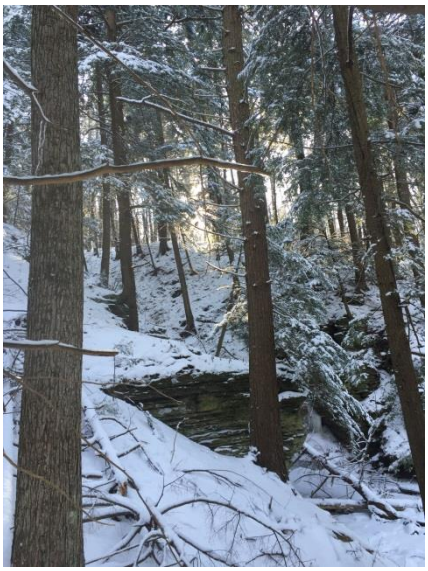

Figure 5Typical FLNF Hemlock stand

Biological and Chemical Control

Local natural predators for HWA are non-existant in eastern North America due to the fact that HWA was only relatively recently introduced from southern Japan. Multiple HWA predators exist in Asia as well as in western North America on the distinct lineage of HWA found there. Studies are being conducted on multiple predators, however control using *Laricobius* beetles of the Derodontidae family are showing to be highly successful due to them being specialist predators of adelgids. *Laricobius nigrinus* is an HWA predator native to western North America that has successfully predated HWA in both laboratory and natural evironments following it's clearance for release after quarantine and study. In 2010, *Laricobius osakensis* a predator beetle native to Japan was cleared for release in the eastern United States due to it's high HWA predation rates and inability to hybridize with North American *Laricobius* species. Research continues on other predator insects and fungal pathogens. (Havill et. al 2014)

Chemical control has been most successful with the neonicotinoid class of systemic insectide, which include imidacloprid and dinotefuran, the pesticides used at Caywood Point. There are numerous application methods for neonicotinoids including soil injection, trunk injection, and spray, however direction for application on Forest Service land is limited to what is recommended by Forest Heatlh Protection (FHP) staff in conjunction with state limitations. Control using the pesticide imidacloprid has been shown to have efficacy against HWA lasting several years with a slow initial uptake, while dinotefuran has a very quick uptake but shorter efficacy. (Ward et. al 2004)

Biological control alone has not been effective in controlling HWA infestations at Caywood Point on the FLNF, or on other National Forests across the range of HWA infestations. This may be in part due to relatively recent development of bio-control in HWA compared to the infestation itself. Succcessful establishment of biocontrol beetles also takes several years, while time continues to advance towards Hemlock mortality. For these reasons quicker acting chemical control is often proposed alongside

biological control. Recent studies have looked at combining biological and chemical controls as an integrated pest management approach with some success. The concept includes treating a subset of infested trees within a stand with chemicals while also releaseing predator beetles. The chemically treated trees will in theory allow predator populations to build in adjacent untreated trees. A higher predator population would then be available for when the chemical treatment wears off. (Havill et. al 2014)

National Forest HWA Suppression Efforts

The HWA infestation in the southeastern and mid-Atlantic United States has been a problem for private and public land managers for several decades. As a result, analysis of and treatment for HWA has been undertaken on several National Forests from Georgia north to Pennsylvania. The following analyses and results have been undertaken on National Forests within the past 10 years, and may be referenced by Forest Service staff during this analysis.

- **Monongahela National Forest**: Environmental Assessment for Hemlock Wooly Adelgid Suppression resulting in a Decision Notice and Finding of No Signifigant Impact, July 2013.
- **Chattahoochee National Forest**: Environmental Assessment for The Conservation of Native Eastern Hemlock by Suppression of Hemlock Wooly Adelgid Infestations resulting in a Decision Notice and Finding of No Signfigant Impact, August 2005.
- **Pisgah and Nantahala National Forests:** Environmental Assessment for the Suppression of Hemlock Wooly Adelgid Infestations resulting in a Decision Notice and Finding of No Signifigant Impact, August 2010.

PURPOSE AND NEED

The purpose and need for this action is to:

- Suppress HWA infestation that may otherwise cause wide spread hemlock mortality on the FLNF
- Maintain the aquatic ecosystem health and diversity provided by hemlock stands.
- Maintain unique wildlife habitat provided by hemlock stands.
- Protect soil and water resources, and to prevent soil loss and water nutrient loading through maintenance of hemlock stands.
- Maintain botanical and ecological diversity and integrity of native species in the threat of non-native invasive plants and pests.
- Maintain the ecological integrity of several mature hemlock-northern hardwood natural communities that represent the special values associated with the Sawmill Creek Ravine candidate Research Natural Area, and The Ravine, Potomac Creek Woods, The Gorge, Breakneck Creek, and Mill Creek Ravine Ecological Special Areas.
- Contribute to healthy ecosystems downstream and on adjacent and far reaching private and public lands.
- Preserve reproducing hemlock populations as seed sources for future establishment and regeneration.
- Maintain the unique aesthetic and recreational values provided by Hemlock stands to visitors on the FLNF.
- Allow for flexibility for timing and use of biological and chemical controls to match Forest Service and public priorities as well as the moving infestation.

The 2006 FLNF Land and Resource Management Plan (Forest Plan) provides several key points that are the basis for the purpose and need of this action:

- “Maintain and restore quality, amount, and distribution of habitats to produce viable and sustainable populations of native and desirable non-native plants and animals” (Forest Plan Goal 2, p. 10).

- "Minimize adverse effects of non-native invasive species on National Forest resources through containment, abatement, and introduction prevention" (Forest Plan 2.2.2 Objective, p.12).
- "Demonstrate innovative, ecologically sound management practices that can be applied to other lands" (Goal 9, p. 14).
- "Maintain and restore ecological processes and systems on the FLNF within desired ranges of variability, including a variety of native vegetation and stream channel types, and their patterns and structural components." (Goal 5, p. 13)
- "Maintain or enhance visual resources such as viewsheds, vistas, overlooks and special features" (Goal 16, p. 16).

The basis for the purpose and need for action is further articulated in two specific Forest Plan Management Areas as follows:
Existing or Candidate Research Natural Area: "The emphasis for an existing or candidate Research Natural Area (RNA) is preservation and protection of ecologically significant natural features, representative ecosystems, and/or unique areas." (Forest Plan 8.3, Major Emphasis, p. 60)
Ecological Special Areas: "Management [of Ecological Special Areas] emphasizes the protection of these values and opportunities for public use and interpretation." (Forest Plan 8.4, Major Emphasis, p. 63)

In regards to Forest Health and Disturbance Processes the Forest Plan gives direction:

- "Non-native insect and disease pathogens shall be managed using appropriate biological, silvicultural or chemical controls. Chemical controls shall only be used when other methods are ineffective" (Forest Wide Standard S-5 p. 28).
- When it is safe and effective to do so, the Forest Service should use an integrated pest management approach to manage NNIS (Guideline-3, p. 28).
    - Conduct early treatment of new infestations
    - Protect Special Areas

If this action is not taken, HWA populations are likely to continue to increase and spread to all hemlock stands on the FLNF, and cause significant mortality to the hemlock trees that are present there. This increased population would also increase the threat for HWA to spread further into New York state or beyond. Hemlock mortality would threaten local ecosystem health, contribute to the imperiled state of the Great Lakes Watershed, and provide a potential foothold for non-native invasive plant spread. Additionally, non-action would affect the aesthetic, visual, and recreational qualities that hemlock stands on the FLNF and Finger Lakes region provide.

PROPOSED ACTION

The proposed action is to allow for biological and chemical control of the Hemlock Wooly Adelgid (HWA) on 2,971 acres of Finger Lakes National Forest land in the following watersheds: Mill Creek, Breakneck Creek, Curry Creek, Sawmill Creek, Ravine Creek, Hector Falls Creek, McBride Creek, Potomac Creek, Hencoop Creek, Spring Brook. (See Map). Project acreages in the above mentioned drainages are proposed for biological and/or chemical treatment as prescribed on a yearly basis by staff from the Green Mountain and Finger Lakes National Forests and Forest Service State and Private Forest Health Protection (FHP) together in consultation with staff and expertise from Cornell Cooperative extension as well as input from the general public. While 2,971 acres are proposed as a total, yearly implementation would be less depending on infestation level, treatment area priority, and funding.

Prioritization of the above mentioned treatment areas would be further directed by guidance from the Forest Plan section 2.3.10: Forest Health and Disturbance Processes (Forest Plan, page 28.) Guideline 3 (G-3) in this section directs priority as follows:

When it is safe and effective to do so, the Forest Service should use an integrated pest management approach to manage non-native invasive species, prioritizing these actions in the following order:

- Prevent introduction of new invasions
- Conduct early treatment of new infestations
- Prioritize treatment in sites that have the greatest ability to provide a source of seeds or propagules for other infestations, such as gravel pits, administrative sites, trailheads, parking lots, campgrounds, and emergency staging areas
- Protect known sites for threatened, endangered or sensistive animals and plants
- Protect Special Areas and Research Natural Areas
- Contain and control established infestations

With this Guideline in mind, Forest Service specialists have been asked to rate the above listed watersheds for priority to retain Hemlock according to their respective resource area (such as soils, ecology, botany, water/wetlands, fisheries, wildlife, and recreation.) The same information was solicited from the public during an open house meeting on January 7, 2015 at the Hector Ranger District. Concurrently, Forest Service staff will continue to document infestation levels through the analysis process. Summarized Forest Service specialist priority treatment areas would be compared against known infestations to select a portion of the total 2,971 acres to treat yearly. Infestations would be monitored across the 2,971 acres on a yearly basis to adjust treatment priority.

Biological control would include release of the *Laricobius nigrinus* (currently released at Caywood Point), and *Laricobius osakensis* beetles in methods proposed by FHP and by individuals permitted for the release of predator beetles by the state of New York. Other federal and state approved bio-controls may be considered in the future.

Chemical control is proposed using the chemicals imidicloprid and or dinotefuran. Imidicloprid would be applied through soil injection of a slow release tablet. The slow-release tablet formulation is designed to release a full dose over a two year period allowing twice as many trees to be treated per acre at one time and goes under the trade name Coretect®. The low dose of imidicloprid is coupled with fertilizer, allowing optimal dose over time while minimizing the risk of contaminating aquatic resources (Cowles 2009). The great advantage of imidacloprid is that one treatment will remain efficacious for seven years or more (Cowles 2009). Coretect® tablets have been used to treat stands of high value hemlock on federal, state, and private land in the Mid-Atlantic States, including Great Smoky Mountain National Park, the Delaware Water Gap National Recreation Area, and the Monongahela National Forest (USDA Forest Service, 2011a, 2011b). The Coretect® formulation of imidicloprid is registered for use for HWA in New York State, and is on file at the Finger Lakes National Forest, Hector Ranger District.

In addition to the Coretect tablets, heavily infested large diameter hemlock trees would have a basal bark application of dinotefuran, trade name: Safari®. Dinotefuran treatment has greater mobility within the hemlock but its efficacy is shorter-lived than imidacloprid. The strategy is to treat the trees in greatest need with dinotefuran so that HWA would be rapidly suppressed, allowing them to recover to the point that they would be able to uptake the slower moving, but longer lasting imidacloprid. Dinotefuran (Safari®) is registered for use for HWA suppression in New York State, and is on file at the Finger Lakes National Forest, Hector Ranger District.

As biological control is ineffective alone in preventing widespread Hemlock mortality given the advanced infestation on the FLNF, chemical control will be proposed in concert. Site specific selection of biological and chemical control would take best available science into consideration to maximize an integrated pest management approach, retain a healthy and diverse hemlock resource, and maximize priority treatment with available funding.

FOREST PLAN CONSISTENCY

The Hemlock Wooly Adelgid Suppression Project is designed to be consistent with the goals, objectives, and Forest-wide and Management Area (MA) Standards and Guidelines as specified in the Forest Plan (as provided in the purpose and need section). The proposed action spans across the following MAs and promotes the desired future condition in each as follows:

Management Area	**Desired Future Condition**
Northern Hardwoods (Forest Plan 2.1, page 48)	"The Northern Hardwood MA will include a continuous forest canopy of primarily northern hardwoods and hemlock…"
Oak Hickory (Forest Plan 3.1, page 49)	"The landscape character will be a mix of oak, hickory, white pine, and other deciduous and coniferous stands,…"
Future Old Forest (Forest Plan 6.1, page 51)	"Areas of Future Old Forest will represent a variety of ecoligcal land types and natural communities where terrestrial and aquatic ecosystems devlelop under natural disturbance regimes. Forests of oak, northern hardwood, and hemlock will dominate…"
North Country National Scenic Trail Special Area (Forest Plan 8.1, page 54)	"North Country Trail users…will encounter a variety of vegetation types including…old growth forest… The unique characteristics and values of areas of ecological importance….will be protected and maintained to the greatest extent possible."
Existing and Candidate Natural Research Areas (Forest Plan 8.3, page 60)	"RNAs are chosen as high quality representatives of ecological communities found on the Forest. In general, they will…contain all or most species characteristic of that community in the region."
Ecological Special Areas (Forest Plan 8.4, page 63)	"Ecological Special Areas will exemplify the special values for which they are designated…They will display moderate to high levels of ecological integrity, while providing opportunities for public use and awareness."

All of the expected environmental effects from this project are anticipated to be within the range of the effects disclosed in the Final Environmental Impact Statement for the 2006 Forest Plan.

ENVIRONMENTAL ANALYSIS

This proposed action potentially falls in a category of actions excluded from analysis in an Environmental Assessment or Environmental Impact Statement, as proposals of this type individually and cumulatively do not have a significant effect on the human environment. This proposal appears to fall under Section 603 of the Healthy Forests Restoration Act (HFRA) (16 U.S.C.6591b). Section 603 establishes a categorical exclusion for qualifying insect and disease projects in designated areas on National Forest System lands. An insect and disease project that may be categorically excluded under this authority is a project that is designed to reduce the risk or extent of, or increase the resilience to, insect or disease infestation in the areas (HFRA, Sections 602(d) and 603(a)).

The environmental effects from the proposed action will be analyzed following NEPA regulations and guidance. The environmental analysis will identify any extraordinary circumstances that exist and could result in significant effects to the environment. At a minimum, the following specific resource conditions will be considered in accordance with 36 CFR 220.6(b):

1. Federally listed threatened or endangered species or designated critical habitat, species proposed for Federal listing or proposed critical habitat, or Regional Forester's sensitive species
2. Floodplains, wetlands, or municipal watersheds

3. Congressionally designated areas (Wilderness or National Recreation Areas)
4. Inventoried Roadless Areas
5. Research Natural Areas
6. American Indians and Alaska Native Religious or Cultural Sites
7. Archaeological Sites, or Historic Properties or Areas

Other resources anticipated to be included in the environmental analysis include soil, water quality and aquatic habitat.

PUBLIC INVOLVEMENT

This project was developed through a collaborative process. The public will continue to be an important source to identify potential improvements to the proposed action including treatment methods and locations to suppress HWA on the FLNF. Public comments received for the project proposal will help focus the environmental analysis on the resource issues of concern. The analysis will be the basis for the final decision. The collaborative process is also anticipated to identify ways the public can assist the Forest Service during the implementation phase of the project following the decision.

DECISIONS TO BE MADE

After conducting and reviewing the environmental analysis, including public involvement and interdisciplinary resource specialist input, the Responsible Official will make the following decisions:

1. Whether the proposed project will proceed as proposed, as modified to address issues, or not at all;
2. What specific resource protection or mitigation measures should be implemented as part of the project;
3. Whether the project would have environmental impacts at levels that may require an EA or EIS; and
4. What monitoring requirements should be applied to the project.

RESPONSIBLE OFFICIAL

Jodie L. Vanselow, the District Ranger the Hector Ranger District of the Finger Lakes National Forests, is the Responsible Official for the decision on this proposal.

Literature cited that accompanies the Finger Lakes Hemlock Wooly Adelgid Suppression Project

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